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REPORT OF COUNCIL

FOR THE YEAR 1916–1917.

To the Fellows of the Royal Society of Canada,

The Council have the honour to present the following report on the work of the Society during the past year:

The last Annual Meeting was held in Ottawa in the Chateau Laurier. The meeting was a very successful one, and the accommodation which was given the Society by the management of the Chateau was, as formerly, excellent. We have been able to make like arrangements for this year's meeting.

I.—Proceedings and Transactions of the Society.

The usual four quarterlies of Volume X have been distributed during the year and a bound copy is laid upon the table for inspection. The volume will be distributed promptly after the meeting.

The volume this year consists of 1,064 pages, with many illustrations. The number of reprints supplied gratuitously to authors was 5,150.

The agenda shows an increase in the number of papers, implying a continuance of the interest of the Fellows in the work of the Society.

II.—Election of New Fellows.

This year there were vacancies in all the Sections and as usual the voting was closed on the 1st April. The Council have much pleasure in reporting that the following candidates received a majority of the votes cast and their election is submitted for confirmation:

Section I.

M. H.-J.-J.-B.-Chouinard, L.B., LL.B., C.M.G.
M. Antonio Perrault, Docteur en droit, Avocat.
L'abbé H. A. Scott, Docteur en Theologie es lettres.

Section II.

James Cappon, M.A., LL.D.
Charles Trick Currelly, M.A., F.R.G.S., O. Medj.
Judge Frederic William Howay, LL.B.

Royal Society of Canada, Report of Council p.6 Biographical Notice for James Loudon

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SECTION III.

John Satterly, A.R.C.Sc., D.Sc., M.A.
Charles Thompson Sullivan, B.A., M.Sc., Ph.D.

SECTION IV.

Archibald Gowanlock Huntsman, B.A., M.B.
Robert Boyd Thomson, B.A.

III.—DECEASED MEMBERS.

It is with deep regret that we record four vacancies in the ranks of the Fellows, which have occurred by death: Dr. C. C. James, Dr. G. C. Hoffmann, Dr. James Loudon and Dr. T. G. Brodie.

Biographical notices of the deceased Fellows appear herewith.

The notice of Dr. James was written by Professor A. E. Lang; Dr. H. M. Ami contributed the notice of Dr. Hoffmann; Dr. J. C. McLennan that of Dr. Loudon; and Dr. J. P. McMurrich has contributed the notice of Dr. Brodie.

CHARLES CANNIFF JAMES.

Charles Canniff James, M.A., LL.D., C.M.G., died suddenly at St. Catharines on June 23rd, 1916.

Dr. James was born at Napanee on the 14th of June, 1863. He was the son of Charles James, J.P., and Ellen Canniff of United Empire Loyalist stock. He was educated in Napanee High School and at the University of Victoria College in Cobourg whence he was graduated, B.A., in 1883 with the Gold Medal in Natural Science. From 1883 to 1886 he was a master in the Cobourg Collegiate Institute, and in the latter year received from his Alma Mater the degree of M.A. The same year, 1886, he was appointed Professor of Chemistry in the Ontario Agricultural College at Guelph. In 1887 he married Frances L., daughter of James Crossen, Esq., of Cobourg, who, with one son, Lieut. Wilfrid Crossen James, survives him.

In 1891, Mr. James was appointed Deputy Minister of Agriculture for Ontario by the Hon. John Dryden, a position which he held for more than twenty years. It was during this period of unremitting, and often thankless, toil that he gained that profound knowledge of agricultural conditions and developed those gifts of organization which finally took him out of his native Province and brought him into the larger service of the Dominion. In 1912 he was appointed to the Dominion Department of Agriculture as Commissioner to administer the Agricultural Instruction Act. There was no other

Canadian so well qualified for this office, and his appointment by the Hon. Martin Burrell met with universal approval. He undertook the new task of advising in the expenditure of the large sums of money granted to the provincial governments for the extension of agricultural education with characteristic energy, never sparing himself in the prosecution of a task which he realised had so important a relation to the welfare of Canadian agriculture.

There are few Canadians living today who could so ill have been spared during the present crisis in the world's history as Dr. James. There are few who, both by training and temperament were so well fitted to direct the energies of the people into channels, the importance of which we have only recently begun to realize. When the war broke out he was one of the first to grasp the supreme importance for the Empire of the food situation, and he organized and threw all his energies into the campaign for increased production and thrift. His untimely death at this critical period was little short of a public calamity.

In Dr. James there were combined in a singularly happy manner the clear-eyed vision of the practical man with the tastes and habits of the scholar. His knowledge of Canadian history was both extensive and exact, and in certain of its phases and periods he was an acknowledged authority. His private library along some lines was remarkably complete, in fact, probably unequalled in Canada. His unique collection of Canadian poetry was presented during his lifetime to the Library of Victoria College, and his large collection of books on Tennyson was bequeathed to the same institution.

Dr. James was not without honour in his own country. In 1911 his name was included in the list of Coronation Honours, when he was created Companion of the Order of St. Michael and St. George. The following year the University of Toronto conferred upon him the degree of LL.D., *Honoris Causa*. Various offers of preferment—political, professional, academic and financial came to him from time to time, but all of these he declined, since their acceptance meant more or less of a severance from what he considered his life work. Anticipating the teaching of some of the modern exponents of social reconstruction, he early recognized that "creativeness" rather than "possession" should be the goal of our common endeavour, and, true to this ideal, he spent his life unselfishly for the common good of the people of Canada.

George Christian Hoffmann.

George Christian Hoffmann, LL.D., F.I.C., M.M.S., F.R.S.C., formerly assistant Director of, and Chemist and Mineralogist to

the Geological Survey of Canada, Curator of the Mineralogical Section of the Museum of that Institution, was born in London, England, on the 7th June, 1837. He received his early education in his home, and in private academies in England, and continued the same in Darmstadt, Germany, under Frederick Haas; and later at the Provinzial-Realschule of that Town.

In 1853 Dr. Hoffmann entered the Royal School of Mines, Jermyn Street, London, under the Directorship of Sir Henry de la Beche, and received instruction from Prof. A. W. Hoffmann, F.R.S., in Chemistry, from Dr. John Percy, F.R.S., in Metallurgy, from Sir Warington W. Smyth, F.R.S., in Mining and Mineralogy, from Sir George G. Stokes (Baronet), F.R.S., etc. in Physics, from Sir Andrew C. Ramsay, F.R.S., in Geology, from the Right Hon. T. H. Huxley, F.R.S., in Natural History, and from the Rev. R. Willis, M.A., F.R.S., in Applied Mechanics.

Having taken a special course in assaying in the Metallurgical Laboratory under Dr. Perry, the subject of this sketch devoted his energies and attention more especially to Chemistry at the Royal College of Chemistry in Oxford Street, London, under Professor Hoffmann, where he spent several years and where he became a junior assistant for two years, following which period he was appointed assistant in the Research Laboratory. In May, 1861, Dr. Hoffmann left England for Natal, South Africa, where he resided for three years engaged under Dr. Robert James Mann, F.R.A.S., Superintendent General of Education in Natal, in the preparation of exhibits from Natal for the International Exhibition of 1862.

After a visit to the Mauritius in 1864, where he acquired some knowledge of the flora of that Island, for which purpose he had gone thither, he proceeded to Melbourne, Victoria, Australia, arriving there October, 1865. In Melbourne, Dr. Hoffmann took charge of the Phyto-Chemical Laboratory of the Melbourne Botanical Garden. There he carried on enquiries into the tanning properties of the barks of certain native trees, besides determining the percentages of tannic and gallic acids (see Report on the Vegetable Products exhibited in the International Exhibition of 1866–67, pp. 39, 40, by Dr. Ferd Von Mueller, F.R.S., Melbourne, 1867).

Dr. Hoffmann also prepared a series of essential oils derived from the foliage of indigenous trees of Victoria, notice of which is recorded in the Catalogue of the Victorian Exhibits to the Sydney Intercolonial Exhibition of 1870, (p. 54, Melbourne, 1870.) Preparations of picric acid from resinous plants, of snuff from one of Australia's common weeds, and determinations of the quantity of soda and iodine from

littoral and other plants were carried out under the direction of the Government Botanist.

Dr. Hoffmann came to Canada in 1871 and spent some months doing general chemical work in Toronto and Montreal. He joined the Geological Survey 1st September, 1872, as Assistant Chemist and served in that capacity under Dr. T. Sterry Hunt until the latter's resignation in 1874, and afterwards under Dr. B. J. Harrington. In 1879 Dr. Harrington resigned from the Geological Survey and Dr. Hoffmann was appointed Acting Chemist and Mineralogist, and on the 1st July, 1880, he was made Chemist and Mineralogist and was given the title of Assistant Director of the Survey. He held this position until his superannuation in 1907, after 35 years' service. He died on the 6th March, 1917.

During Dr. Hoffmann's connection with the Geological Survey of Canada, he brought out twelve reports entitled:—"Chemical Contributions to the Geology of Canada," and as a continuation of the same a further series of seven reports bearing the title :—"Report of the Section of Chemistry and Mineralogy." These were issued in the Reports of Progress of the Geological Survey of Canada, from 1874 to 1883; and continued in the Annual Reports (new series) of the Geological Survey of Canada from 1885 to 1900. Dr. Hoffmann's latest "Reports of the Section of Chemistry and Mineralogy" for 1903–1905 was issued as a separate. These several reports include 980 large octavo pages of the Government reports and contain analyses and descriptions of minerals including 46 species and 17 varieties of species not previously identified as occurring in Canada.

Besides the above contributions and additions to our knowledge of the minerals occurring in Canada, Dr. Hoffmann carried on a very considerable number of analyses dealing with fossil fuels, including peat, lignified wood, lignite, lignitic coals, coals of the Carboniferous, Cretaceous, and Tertiary ages, anthracitic coals, semi-anthracites, and anthracites from various parts of the Dominion. He also made a great many analyses of natural waters with the object of ascertaining their suitability for domestic, manufacturing or irrigation purposes or their possible therapeutic value, as the case might be. The waters included those of rivers, lakes, natural and artificial springs and salt springs occurring in various parts of Canada. Further analyses by Dr. Hoffmann include those of limestones and dolomites carried out with a view of ascertaining their merits for structural purposes, or their suitability for the manufacture of lime, hydraulic cement, or for metallurgical purposes, and other uses. Besides these Dr. Hoffmann also made numerous complete analyses of Canadian marls, analyses of iron, copper, lead, and manganese ores; also analyses of nickel and

cobalt ores, in which the Dominion is so rich; besides assays for gold, silver and other precious metals. He also published the "Catalogue of Section I of the Museum of the Geological Survey of Canada" in 1893, which catalogue contained 256 pages, royal 800, issued by Dr. S. E. Dawson, Queen's Printer, Ottawa, 1893.

Dr. Hoffmann's bibliography is extensive and forms a valuable collection of most instructive and suggestive reports and contributions on the natural resources of various portions of the British Empire more especially of South Africa, Australia, and Canada.

It is interesting to note that Dr. Hoffmann bequeathed $35,000.00 to Queen's University, Kingston, to establish two fellowships in connection with the medical faculty.

James Loudon.

James Loudon, ex-President of the University of Toronto, was born at Toronto in 1841. He received his early education at the "Blue Grammar School" and at Upper Canada College, and in 1862 he graduated from the University of Toronto as Gold Medallist in Mathematics.

In 1864 he became a member of the staff of University College, first being Classical Tutor and then Mathematical Tutor and Dean of Residence. In 1872 he was elected as one of the graduate representatives on the University Senate, and for twenty years continuously represented the graduates on that body.

In 1875 he became Professor of Mathematics and Physics in the University of Toronto but in 1887 the Chair was divided and Professor Loudon became the head of the Department of Physics. In 1892 on the death of Sir Daniel Wilson Professor Loudon was appointed to the presidency of the University of Toronto and this position he held until 1906 when failing health necessitated his resignation.

Professor Loudon's contributions to Science, though not extensive, are of a high order and consist of papers on Acoustics and on Geometry with applications of geometrical methods to Co-ordinate systems, Mechanics and Optics. He was never able to secure for himself the leisure necessary for the advancement of scientific knowledge, but was continually constrained to apply practically the whole of his time, energy, and thought, to the development of the University.

He early championed the project to introduce laboratory instruction in the Sciences into the University and this was finally achieved in 1878. The organisation of what is now the Faculty of Applied Science was carried out on the basis of a report which he drew up for the Minister of Education, the late Mr. Adam Crookes. On his initiative the Fellowship system was introduced and in 1885, on a resolution

which he carried in the Senate, the Degree of Doctor of Philosophy for Research was instituted.

Among the various schemes which he either directly initiated or heartily supported during his occupancy of the Presidency were the institution of the Faculties of Forestry and Pedagogy, and the erection of the Library, the Chemical and Physical Laboratories, the Gymnasium, the Convocation Hall, and the Medical Building. The University Press was established on his recommendation and the movement which culminated in the organisation of the Faculty Union, the Students' Union, and the Alumni Association was due to his inspiration.

He took a leading part in the practical working out of the federation scheme by which Victoria, and the Trinity Arts and Medical Faculties became component parts of the University, and in the development of the University after federation it was largely through his efforts that the various Departments of Modern Languages gained a proper and adequate recognition of their claims for support.

Dr. Loudon took a keen interest in the activities of The Royal Society of Canada from the date of its organization. He was elected President of the Society for the year 1900-1901. At the Annual Meeting held in his honour in Toronto in the spring of 1901 he gave, in a remarkably able address, a most interesting account of the progress made in Acoustics in the nineteenth century.

After retiring from the University in 1906 he was compelled by ill-health to confine his activities within very narrow limits. He was able however to act as Chairman of the Council of the College of Art, and it gave him great pleasure to assist in the development of the work of this institution.

Dr. Loudon was a strong Canadian, and he was an able advocate of all that was great and good in British institutions. The friendly relations which have been established between the Departments of Physics in Toronto and Cambridge, arose in great measure from his directing students looking for facilities for post-graduate work to England at a time when it was rather popular in America to turn to Germany for advanced work.

Dr. Loudon was fine and discriminating in his mode of thought and singularly clear in his judgments. He was quick to grasp the vital factors in problems which came before him for solution. His methods were always quietly constructive and free from cant and self deception. In working out his policies he had frequently to act with limited support, but whatever his conscience and intellect dictated that he followed up with patience and courage.

Thomas Gregor Brodie.

In these days, when Canada and the Empire need as never before the zealous services of their sons in whatever field of endeavour they may excel, we feel a keener sense of loss when death removes from among us such an one as Professor Thomas Gregor Brodie. A skillful investigator in his chosen field, his past achievements had given promise of even more important contributions to the progress of physiology and medical science, but on August 20th, 1916, he died at his residence in London from an attack of angina pectoris, having been called with tragic suddenness in the very prime of life.

Professor Brodie was the second son of the Rev. Alexander Brodie, Vicar of Grandborough, and at the time of his death had but completed his fiftieth year. He received his early education at King's College School and later entered St. John's College, Cambridge, but having decided upon a medical career he withdrew from Cambridge before graduation and entered upon his medical studies at King's College, London. As a student he pursued an especially brilliant course, and after receiving the degree of M.B., and, later, M.D., from the University of London, he was appointed in 1890 Demonstrator of Physiology in King's College, under Professor Halliburton. This appointment was decisive so far as his future career was concerned, though even in his student days he had shown an interest in and marked aptitude for physiological investigation, his earlier contribution on Muscular Elasticity still remaining authoritative.

His abilities as a teacher soon led to more responsible positions and in 1894 he was appointed Senior Demonstrator of Physiology at the London Hospital, in the succeeding year Lecturer in Physiology at St. Thomas Hospital and in 1899 his ability as an investigator was recognized by his appointment as successor to Professor Sims Woodhead in the Directorship of the Research Laboratories of the Royal Colleges of Physicians and Surgeons. This last position he filled with distinction until 1902, when, from motives of economy, the Colleges closed the Laboratories in order that they might be able to lend support to the newly established Lister Institute of Preventive Medicine. For a few succeeding years Professor Brodie, like several other English scientists of distinction before him, was forced to eke out a livelihood by combining the emoluments from several positions, each one by itself yielding an altogether inadequate and insufficient remuneration. He was at once Professor of Physiology in the Royal Veterinary College, Professor-Superintendent of the Brown Animal Sanatory Institute and Lecturer in Physiology to the London School

of Medicine for Women, which last post he had held throughout his tenure of the Directorship of the Laboratories of the Royal Colleges.

The work thus entailed was excessive, but Professor Brodie nevertheless managed to continue his investigations and in 1904 the merits of his contributions were recognized by his election as a Fellow of the Royal Society of London. When in 1907 the Chair of Physiology, as it is at present defined, was established in the University of Toronto, Professor Brodie was offered and accepted it and in the autumn of 1908 entered upon the duties that were to be his to the end. His thorough knowledge of the requirements of a physiological laboratory, both for teaching and research, stood him in good stead in his new position and his ability for organization soon placed him in control of a laboratory, which, as regards its equipment, ranks among the best. This in itself was an important service to Canadian science and when is added to that the stimulus which his enthusiasm imparted to others and the interest which his teaching awakened in his students, some appreciation may be had of his services to science in this land of his adoption. Professor Brodie was with us but for eight brief years, yet what he accomplished here is not of the present or the past, but is destined for full fruition in the years to come.

Professor Brodie was elected a Fellow of this Society in 1911, and in that same year he was further honoured by being appointed to the Croonian Lectureship of the Royal Society of London, the subject of his lecture being certain phases of important work that he had accomplished on renal secretion, for the most part in his laboratory in Toronto. Shortly after the outbreak of the war Dr. Brodie volunteered for active service and, with the rank of Captain, accompanied No. 4 University of Toronto Base Hospital overseas. During the stay of the contingent in England he began investigation in the London Hospitals of the respiratory processes in connection with wounds and disease, with so much promise of important results that he was detached from the unit when it was sent to Saloniki, remaining in London to carry on his observations. It was in this work that he was engaged at the time of his death, latterly, however, adding to it the Superintendentship of the Military Hospital at Ramsgate where, had he been spared, his abilities would have been devoted to the re-education of maimed soldiers in useful occupations.

As a Physiologist Professor Brodie's chief strength lay in his operative skill and in the resourcefulness which enabled him to overcome the difficulties always attendant upon experimental work. Clear in his reasoning, accurate in expression and thorough in investigation, Dr. Brodie has left several important contributions which bear the

stamp of originality and authority. He was not, however, a prolific writer, his love of thoroughness sometimes withholding results, quite worthy of publication, in the hope of further elucidation; his unpublished manuscripts, when given to the world will but confirm the reputation he has already achieved and awaken regret that he could not have been spared to complete them to his own satisfaction.

IV.—Address of Welcome to His Excellency The Duke of Devonshire, Governor General, etc.

On February 1st a delegation consisting of the President and eleven other members of the Council waited upon His Excellency and submitted the following address:—

February 1st, 1917.

To His Excellency the Duke of Devonshire, K.C., G.C.V.O.,
Governor General of Canada,
Government House,
Ottawa, Ont.

Sir,

The Royal Society of Canada begs leave to offer you a most sincere and earnest welcome to this country.

The Society was founded in the year 1882 by one of your distinguished predecessors in the Government of Canada, the late Duke of Argyll (then the Marquis of Lorne.) In the following year it was incorporated by Act of Parliament, its objects as therein set forth being to encourage studies and investigations in literature and science, to offer prizes or other inducements for valuable papers on subjects relating to Canada, and to publish annually or semi-annually records of the work performed and papers and memoirs of merit.

After an existence of 34 years the Society may be said to have had a large measure of success in accomplishing the purposes for which it was founded.

Its transactions are published quarterly and are also collected in an annual volume; and through its various corresponding societies and institutions, as well as in other ways, they are widely distributed, and it is believed are highly appreciated. Annual meetings are held for the reading and discussion of papers. To

these the public are freely admitted, and every effort is made to direct the activities of the Society in lines of public usefulness.

Since the present unhappy war broke out several of our members have been usefully engaged in active service in various capacities in which their professional attainments render them valuable to the cause of Great Britain and her allies. At its last annual meeting the Society memorialized the Government on the importance of organizing the scientific forces of the Dominion to aid in the vigorous and efficient prosecution of the war, and in the development of Canadian industries to meet present conditions and those which will prevail after the war. The society offered its services collectively and individually for this work, and it is a subject for congratulation that the Government has established an Honorary Advisory Council for Scientific and Industrial Research. The Council consists of eleven members, five of whom are Fellows of the Society, and the Chairman is its President.

The regulations which the Society adopted under authority of the statute designate the Governor General as Honorary Patron of the Society, and we venture to hope that Your Excellency will permit us to add your name to the hitherto unbroken line of Governors-General who have filled that office. Your Excellency's well-known interest in scientific and literary matters encourages us to believe that the efforts of our Society to fulfil the useful mission assigned to it will be regarded by Your Excellency with a friendly eye.

With renewed assurances of our devotion to the Throne and Empire and an earnest wish that the sojourn of Your Excellency in Canada may be in every way a pleasant one and be attended with the best results, we remain, Sir, with profound respect, Your Excellency's most dutiful and most obedient servants.

Signed on behalf of the Council and Fellows of the Society.

DUNCAN C. SCOTT, *Honorary Secretary.*

A. B. MACALLUM, *President.*

His Royal Highness made a felicitous reply to the address and stated in very cordial words that he felt honoured to become the Honorary Patron of the Society.

V.—Enquiry into the Damage done by Insects to Grain in Store.

On the 6th July, 1916, the President of The Royal Society of Canada received the following communication from the Secretary of The Royal Society of London:—

Burlington House,
London, W.
6th July, 1916.

Sir,

At the request of the Board of Agriculture the Council of the Royal Society has appointed a Committee to inquire into the damage done by insects to grain in store.

In view of the fact that such an enquiry would be likely to prove more fruitful if the insect pests were simultaneously investigated in the countries growing and shipping the grain, the Council has decided to invite the co-operation of the Scientific Societies of the Dominion of Canada and the Commonwealth of Australia, and to ask for the assistance of the India Office.

I therefore write to know whether the Royal Society of Canada would be willing to take up this investigation for the Dominion, either by appointing a Committee similar to our own, with similar terms of reference, or in any other way which seems best to your Society.

I enclose a list of those serving on our Committee and a copy of the terms of reference.

I am, Sir,
Your obedient servant,
W. B. Hardy,
Secretary R. S.

The President,
Royal Society of Canada.

Grain Insect Committee.

Terms of Reference.

To consider the relative economic importance of the species and varieties of insects infesting grain, to suggest measures for combating them, and to enquire into the extent of the actual loss from these pests.

Committee.

Professor V. H. Blackman, F.R.S., Professor of Plant Physiology and Pathology in the Imperial College of Science and Technology.
Professor Arthur Dendy, F.R.S., Professor of Zoology in the University of London, (King's College).
Mr. J. Hartley Durrant, Entomologist at the British Museum.
Professor J. Stanley Gardiner, F.R.S., Professor of Zoology and Comparative Anatomy in the University of Cambridge.
Mr. W. B. Hardy, M.A., Secretary, Royal Society.
Sir Alfred Bray Kempe, Treasurer, Royal Society.
Professor Robert Newstead, F.R.S., Professor of Entomology in the School of Tropical Medicine, University of Liverpool.
A representative of the Board of Agriculture.
A representative of the Milling Trades.

It was considered by the President that the formation of a Committee to act in co-operation with the Committee of the Royal Society would be quite in line with the efforts of our Society to be useful in an economic way.

The President nominated Dr. C. Gordon Hewitt, Dr. E. M. Walker and Dr. C. J. S. Bethune as a Committee, with Dr. Hewitt as Chairman.

The report of the Committee which was forwarded to the Secretary of the Royal Society of London on March 12, 1917, was as follows:—

REPORT ON THE DAMAGE DONE BY INSECTS TO GRAIN IN STORAGE IN CANADA.

In November, 1916, a Committee of The Royal Society of Canada consisting of the following members was appointed by the President:—

Dr. C. Gordon Hewitt, F.R.S.C., Dominion Entomologist, Department of Agriculture, Ottawa.

Prof. C. J. S. Bethune, F.R.S.C., Professor of Entomology, Ontario Agricultural College, Guelph, Ont.

Dr. E. M. Walker, F.R.S.C., Asst. Professor of Zoology, University of Toronto, Toronto, Ont.

This Committee was asked to conduct the following enquiry:—

To consider the relative economic importance of the species and varieties of insects infesting stored grain, to suggest measures for combating them, and to enquire into the extent of the actual loss from these pests.

As the Entomological Branch of the Canadian Department of Agriculture has been conducting a special investigation on this question for some time, Dr. C. Gordon Hewitt, the Dominion Entomologist and Chief of this Branch, under whose direction the investigation is being carried on, has prepared the following report for the Committee on the results of this investigation up to date:—

Canadian Conditions as Affecting Losses.

In view of the occurrence in Canada of a number of grain-infesting insects, which are responsible every year for considerable losses to certain classes of stored grain and grain products, it might be assumed, in view of the enormous amount of grain produced in Canada and stored for shipment, that the losses from grain infesting insects might be serious, as is not infrequently the case in other parts of the world. Fortunately, however, there exist two factors which are operative in Canada in an economically favourable direction, namely, short storage and climate.

The greater portion of the grain, such as wheat, oats, barley, etc., produced in Canada is stored in the grain elevators and other places of storage for a comparatively short time; the period depending largely upon the conditions of the world's grain markets. The statistics respecting the Canadian wheat crop of 1915, which are the latest complete figures available, illustrate this fact clearly. In the "*Census and Statistics Monthly*" (Department of Trade and Commerce), Vol. 9, January 1916 it is stated that the balance of the 1915 crop available for export amounted to 264,173,200 bushels. In the *Weekly Bulletin* (Department of Trade and Commerce) Vol. 15, No. 671, December 4th, 1916, the total quantity of wheat stored at terminal elevators, interior elevators and public elevators in the East for the week ending November 24th, 1916, was stated to be 20,991,108 bushels. These figures show how comparatively quickly the grain crop moved and how little, if any, is stored in the elevators for a sufficient length of time to permit damage by insects affecting stored grain.

The extremely low winter temperatures that prevail in the districts where grain is stored would have a controlling effect on insects infesting grain stored in unheated buildings.

On account of the aforementioned facts, and especially the rapid movement of the grain crop, serious losses to stored grain are not experienced in the elevators where the main portion of Canadian grain is stored. Our experience is confirmed by reports submitted to me by the Board of Grain Commissioners of Canada; one of their oldest inspectors reported that during an experience of over thirty years managing terminal and storage elevators he had never met a single instance of deterioration or injury to grain caused by insects while in store.

Insects Affecting Stored Grain in Canada.

Where grain is stored for two or more years in warehouses or other buildings, particularly if they are heated, losses are liable to occur in Canada through infestions of a number of species of insects that attack grain and stored products. The commonest of these are the grain weevil *Calandra granaris* L., and the rice weevil *C. oryzae* L., both of which are introduced insects. There are a number of species of insects which we have found attacking stored products such as flour and meal and which will readily breed in grain stored in the neighbourhood of such products. Among these may be mentioned the flour beetles *Tribolium confusum* Duval, and *T. ferrugineus* Fab., the saw-toothed grain beetle *Silvanus surinamensis* L., the cadelle *Tenebrioides mauritanica* L., and the flour and meal moths *Ephestia kuehniella* Zell., *Plodia interpunctella* Hbn., and *Pyralis Farinalis* L. Occasionally the Angoumois grain moth *Sitotroga cerealella* Oliv., and *Tinea granella* L., are found causing damage to stored grain.

CONTROL MEASURES.

Carbon bisulphide: Fumigation with carbon bisulphide has been successfully used for many years in Canada for the destruction of insects affecting grain and other stored products. Experiments have shown that it is inadvisable to attempt to fumigate at a temperature of 60 degrees F. or lower. At a temperature of 70 degrees F. and higher the use of four pounds of carbon bisulphide to every thousand cubic feet of space is recommended and the fumigation should last for thirty-six hours; if the grain is not to be used for seed an exposure of forty-eight hours to the fumes may be allowed with good results.

Hydrocyanic Acid Gas: This common mode of fumigation has not been found entirely satisfactory for these insects as the gas does not appear to have sufficient power of penetration under ordinary conditions to kill the insects in every stage. Perhaps fumigation with the gas under a vacuum might be successful but its application would be restricted.

High Temperatures: We have recently been conducting experiments on the use of high temperatures, or "Superheating," for the control of insects infesting stored products in mills and warehouses, with very satisfactory results. Where this method is employed it is necessary to have a system of heating the building that will give and maintain for not less than six hours a temperature of 120 degrees F. to 125 degrees F. For this purpose it is usually necessary to instal in the storage building additional means of heat radiation, but such additions are permanent and a single application per annum is sufficient as a rule to maintain control over these insects. The superior penetrating power of the super-heating method is a great advantage.

Low Temperatures: In Canada where low winter temperatures occur it has been found that such temperatures in many cases prove fatal to insects affecting stored products. At Ottawa the larvae and adults of the flour moth have been killed by an exposure to a temperature of 50 degrees F. *Silvanus surinamensis* L., has been killed by exposing seeds infested with this species to a zero temperature at Ottawa. The pea weevil *Bruchus pisorum* has been killed at Ottawa by exposing seed containing the weevils to a temperature of 18 degrees F. The occurrence of low temperatures throughout many parts of Canada where grain is grown or stored has an undoubted effect in reducing the total damage caused by insects affecting stored grain and other products.

Estimates of Loss Due to Insects Affecting Stored Grains.

It is not possible to give any estimate that would be of value of the annual loss caused by insects affecting stored grain in Canada. It is estimated in the United States that at least five per cent of the cereal crops are destroyed by insects while in storage, but for reasons already given it is unlikely that this estimate would apply equally to Canada. In any case in the absence of more exact information any estimate would be little more than a guess.

The Committee of the Royal Society of Canada has adopted the foregoing and has pleasure in submitting it for the information of the Committee appointed by the Royal Society of London.

VI.—The Honorary Advisory Council for Scientific and Industrial Research in Canada.

One of the most striking results of the great war is the sudden awakening of the English speaking world to the importance of scientific and industrial research, and the realization by Governments of the necessity of applying scientific research to the whole range of problems which present themselves in both war and peace.

With the declaration of war the supplies of several classes of products for which Great Britain had come to rely almost exclusively upon Germany—in the manufacture of which that country has gradually secured a practical monopoly—were suddenly cut off. Some of these, such as dye stuffs, optical glass, etc., were of vital importance to certain of Great Britain's industries, which were very seriously threatened by the impossibility of securing adequate supplies of these necessary materials. Some of these materials were even needed for the manufacture of arms and munitions of war, and the necessity of making Great Britain independent of foreign countries not only for the requirements of industry but also for the essentials of national defence was thus made clear.

The Government of Great Britain, having been brought to a realization of these facts, appointed in July, 1915, a committee of the Imperial Privy Council for Scientific and Industrial Research, with an advisory council composed of eight men distinguished in the world of science and industry "for the development of scientific and industrial research" applicable to the problems of war and the development of the industries of peace that follow the war.

The Government of Australia thereupon established "a Commonwealth institute of science and industry" along similar lines. New Zealand and India have also expressed a desire to co-operate with the Imperial Government in every possible way.

If, after the war, the industries and manufactures of the Dominion are to develop and expand in the face of the very rigorous competition which will grow up under the conditions which will follow the declara-

tion of peace, it is necessary that our industrial and manufacturing operations shall be carried on with much more efficiency than has, as a general rule, characterized them in the past.

Taking a leaf out of our enemies' book, and for the purpose of making a first step toward the closer application of science to the industrial development of the Dominion, the Government of Canada on June 6th, 1915, appointed a Committee of the Canadian Privy Council consisting of the Right Honourable the Minister of Trade and Commerce (Chairman), the Honourable the Ministers of the Interior, Agriculture, Mines, Inland Revenue and Labour, to devise and carry out measures to promote and assist scientific and industrial research with a view to the fuller development of Canadian industries and production in order that during and after the present war they may be in a position to supply all Canadian needs and to extend Canadian trade abroad.

Under this committee of the Privy Council there was constituted on the 29th of November, an Honorary Advisory Council for Scientific and Industrial Research, composed of the following eleven members, representative of scientific and industrial interests of Canada:—

A. B. Macallum, M.D., Ph.D., Sc.D., LL.D., F.R.S., Administrative Chairman, Ottawa.

F. D. Adams, Ph.D., Sc.D., LL.D., F.R.S., Dean, Faculty of Applied Science, McGill University, Montreal.

T. Bienvenu, Esq., Vice-President and General Manager, La Banque Provinciale du Canada, Montreal.

R. Hobson, Esq., President, Steel Company of Canada, Hamilton, Ont.

S. F. Kirkpatrick, M.Sc., Professor of Metallurgy, Queen's University, Kingston, Ont.

J. C. McLennan, Ph.D., F.R.S., Professor of Physics and Director of the Physics Laboratory, University of Toronto, Toronto, Ont.

A. S. Mackenzie, Ph.D., D.C.L., President, Dalhousie University, Halifax, N.S.

W. C. Murray, M.A., LL.D., President, University of Saskatchewan, Saskatoon, Sask.

R. A. Ross, Esq., E.E. (Tor.), M. Can. Soc. C.E., Consulting Engineer, 80 St. Francois Xavier St., Montreal, Que.

R. F. Ruttan, M. A., M.D., Sc.D., Professor of Chemistry, and Director of the Chemical Laboratories, McGill University, Montreal, Que.

Arthur Surveyer, B.A.Sc., M. Can. Soc. C.E., Consulting Engineer
274 Beaver Hall Hill, Montreal.

Secretary: J. B. Challies, C.E. (Tor.), M. Can. Soc. C.E., Superintendent, Dominion Water Power Branch, Department of the Interior, Ottawa.

This Advisory Council, by direction of the Chairman of the Committee of the Privy Council, has been charged with the following duties:

(a) To ascertain and tabulate the various agencies in Canada which are now carrying on scientific and industrial research in the universities and colleges, in the various laboratories of the Government, in business organizations and industries, in scientific associations or by private or associated investigators.

(b) To note and schedule the lines of research or investigation that are being pursued by each such agency, their facilities and equipment therefor, the possibilities of extension and expansion, and particularly to ascertain the scientific man power available for research and the necessity of adding thereto.

(c) To co-ordinate these agencies so as to prevent overlapping of effort, to induce co-operation and team work, and to bring up a community of interest, knowledge and mutual helpfulness between each other.

(d) To make themselves acquainted with the problems of a technical and scientific nature that are met with by our productive and industrial interests, and to bring them into contact with the proper research agencies for solving these problems, and thus link up the resources of science with the labor and capital employed in production so as to bring about the best possible economic results.

(e) To make a scientific study of our common unused resources, the waste and by-products of our farms, forests, fisheries and industries, with a view to their utilization in new or subsidiary processes of manufacture and thus contributing to the wealth and employment of our people.

(f) To study the ways and means by which the present small number of competent and trained research men can be added to from the students and graduates of science in our universities and colleges, and to bring about in the common interest a more complete co-operation between the industrial and productive interests of the country and the teaching centres and forces of science and research.

(g) To inform and stimulate the public mind in regard to the importance and utility of applying the results of scientific and industrial research to the processes of production by means of addresses

to business and industrial bodies, by the publication of bulletins and monographs, and such other methods as may seem advisable.

In pursuance of the work with which it has been charged, the Council, in order to develop in Canada a body of men who have been thoroughly trained in science and its application to industry, such as that which has aided so greatly in the industrial development of Germany in recent years, has recommended to the Government the establishment of twenty or more studentships and fellowships in Canadian universities and technical schools, to be given to men who have completed their regular course of study and have displayed a special aptitude for scientific research.

These will enable such men to pursue a course of advanced work for a further period and thus acquire a practical training in the methods and conduct of research. Arrangements are also contemplated whereby students will be placed in one or other of the great manufacturing establishments of the Dominion, where they will continue their training under the conditions of actual commercial practice.

For the purpose of making a complete census or inventory of all work in scientific and industrial research which is being carried on in the Dominion at the present time by all the agencies now at work, and also for the purpose of ascertaining the various lines and directions in which the application of research was most necessary and might be made most fruitful in the development of our industries and manufactures, the Council in the spring of 1917 issued questionnaires to all the Universities, Government Departments, Technical Societies, as well as to all Canadian Manufacturers, asking under definite heads for specific information on the various subjects which come within the purview of the Council. In the distribution and in the collection of proper returns from these questionnaires the Council has received the active, energetic and sympathetic assistance of the various Technical Societies of the Dominion, as well as of the Canadian Manufacturers' Association.

The Council has also enlisted the close co-operation of all the Government Departments, both Federal and Provincial, for the purpose of correlating and rendering more easily accessible the wealth of information concerning the Natural Resources of the Dominion which lie stored in the Government Archives and Reports.

In addition to this broad and general work which looks toward the establishment of a substantial basis for the further development of the industries of the Dominion in the immediate future, the Council has examined carefully a large number of specific projects which have been submitted to it, and has approved of certain of these which appear to give promise of valuable results.

They have decided to recommend that two of these projects be at once taken up and work be started upon them immediately. The first has for its object the provision of an adequate supply of good fuel for the Western Plains, more especially in the Provinces of Saskatchewan and Manitoba. There are in the former Province large supplies of lignite. This is an inferior fuel possessing a relatively low heating power and which, furthermore, will not stand shipment and storage. It is, therefore, of comparatively little value for domestic or manufacturing purposes. The Council, however, believes that by a special treatment there may be produced from this lignite two grades of high class briquetted fuel, one similar to anthracite or hard coal in character, and the other resembling soft coal in general character, and at the same time certain valuable by-products may be secured. The Department of Mines and the Commission of Conservation have already carried out a good deal of investigation in connection with this problem, and the former Department is now making some further studies for the Council. If they give satisfactory results the Council will advise that a plant to turn out this high-grade fuel on a commercial scale be erected, and the possibility of producing this fuel at a cost considerably lower than that at which coal from the United States is now laid down in Manitoba and Saskatchewan be demonstrated on a large scale, the coal being actually placed on the market. With an abundant supply of good cheap fuel the conditions of life on the great plains in winter will be much improved.

The other project has to do with the preservation of the forests of eastern Canada. These, contrary to the opinion which prevails generally, are not inexhaustible. They have already been seriously depleted and are rapidly deteriorating in character. In most of the leading countries of Europe the forests, whether owned by the Government or by private interests, have, by the application of modern scientific knowledge, been immensely improved in character, and, instead of being plundered and then abandoned, have been converted into assets of enormous national value, and which year by year yield large revenues to the Government, or to their private owners, which are as regular and as continuous as those from any other gilt-edged investment, the forest all the time being maintained with its capital unimpaired.

Different methods of forest management have been adopted in different parts of Europe to secure this splendid result. The Canadian forests present special problems of their own. The Council has recommended that the necessary means be provided in order to enable the Forestry Branch of the Department of the Interior to carry out certain investigations for the purpose of ascertaining which of these

methods can best be applied to the Canadian forests with a view to stopping the destruction which now threatens them, and of making these forests a great and permanent source of wealth to the people of the Dominion.

Many other projects and many additional lines of work are under consideration by the Council, but these require further examination before the Council is in a position to decide what action should be taken with reference to them.

VII.—The 72-Inch Reflecting Telescope.

The mounting of the 72-inch telescope, with its dome and building was completely erected during the summer of 1916, and now requires only the mirror to enable actual observing work to be started.

The dome was shipped from Cleveland at the end of March, 1916, and arrived in Victoria about April 15. Erection of the structural work was completed early in July, and the double sheet metal covering was in place in October. The operating mechanism and accessories for the dome were installed and adjusted in October and is now in practical working order.

The mounting of the telescope, which was shipped from Cleveland about the end of July and arrived in Victoria about three weeks later, was hauled to the site and ready for erection by the first of September. Erecting was begun on the fifth, and in ten days all the heavy parts of the telescope were in place, an indication of the care used in fitting at Cleveland. The extensive permanent wiring required some time, so that the final completion of the erection was delayed until about the middle of October.

The telescope was then placed in adjustment and dome and mounting thoroughly tested. Both work to perfection, and the whole installation is undoubtedly the best designed and most complete and convenient in operation of any ever built, and reflects great credit on the makers, the Warner and Swasey Co. of Cleveland.

The parabolization of the principal mirror, 73 inches in diameter, was delayed for lack of a large plane to test the surface, but this need has been met and the mirror is now rapidly approaching completion. It is expected to be finished in the first part of June, and as soon as it reaches Victoria a very few days will suffice to place it in position and work with the instrument can be commenced.

As no additional buildings can be obtained this year, it is proposed that the director and one assistant shall make the necessary preliminary adjustments and experimental work, preparatory to undertaking the complete programme as soon as the buildings are ready. In this way this work can be efficiently carried on and the instrument profitably employed in the interim.

X.—Report of Honorary Librarian.

The Honorary Librarian begs to report that on the advice of a special committee, a series of 300 volumes has been selected and is now being bound in buckram, a material represented as being the most durable for large volumes. The series comprises about 100 volumes of reports of the Royal Society of London, 30 volumes of the Royal Society of Edinburgh and about the same number each from the Royal Societies of Glasgow, Dublin, South Australia, Queensland, Victoria, New South Wales, Tasmania and South Africa. A few volumes in some of the above not being complete are withheld for the present. The binding of the publications of the Associated Royal Societies was thought to be of the first importance, other Scientific or Historical works will be added to the list to complete the contract. In answer to the appeal sent out by the secretaries of the various sections for donations of the works of members of the Society the Library has received the following:—

Donor	*Volumes*	*Pamphlets*	*Subjects*
L. J. Burpee	1	21	Historical.
Col. G. T. Dennison	5	1	Military tactics.
D. B. Dowling	4	20	Economic Geology.
R. A. Falconer	1	3	
F. C. Harrison		1	Bacteriology.
Abbé V. O. Huard	8	6	Geology.
C. C. James		10	Agriculture.
W. L. Mackenzie King	1		Heroism.
L. M. Lambe		1	Palæontology.
J. W. Longley	2		Literature.
Jas. Mavor	1	1	Economics.
R. G. McConnell	2	10	Geology.
W. McInnes		7	Geology.
R. W. McLachlan		22	Numismatics.
W. A. Parks	8	5	Geology.
J. Ross Robertson	9		History of Freemasonry; and, Landmarks of Toronto.
D. C. Scott	5		Poems.
Dr. S. Vincent	1	50	Biology.
Sir B. E. Walker	1	22	Economics.
E. M. Walker		20	Biology.
Jas. White	9		Historical and Engineering.
George M. Wrong	1		Crusade of 1383.

Other donations from individuals include:

1 volume on electricity by W. F. Badgely.

1 volume on Belgian Neutrality by the Belgian Consul.

20 pamphlets on Bacteriology by Dr. C. Gorini.

1 pamphlet on mining by D. H. Newlands.

50 pamphlets by Mr. W. R. Riddell.
1 volume by Roby Datta.

Through the efforts of Mr. L. J. Burpee, the Secretary of Section II, generous donations have been received from the following societies:

Illinois State Historical Society. 16 volumes.
Michigan Historical Commission. 36 volumes.
Michigan Historical Society. 9 volumes.
Wisconsin State Historical Society. 22 volumes.
Canada, Archives. Reports for 1909, 1912, 1913, and other publications.

The above donations are in addition to the usual receipts from the exchange list of associated societies.

D. B. Dowling,
Honorary Librarian.

XI.—Finances of the Society.

The extraordinary expenditures on account of the war, which have necessitated the curtailment generally of Parliamentary appropriations, have resulted in the diminution of the grant usually made by Parliament. The appropriation for the last year was $8,000.00, but for the year 1917–18 it has been reduced to $4,000.00. We are sure that the Fellows of the Society will be willing to co-operate with the Council in carrying out the economies indicated by the decrease in our revenue. Our printed Transactions will have to be curtailed in volume and each Section must be limited as to space. The Council would recommend that each Section advise its printing committee to be governed accordingly and to endeavour to select, and if necessary condense the available material so that the Transactions may not suffer in value or importance by the unavoidable retrenchment.

It is confidently hoped that after the war the grant will be increased to its former amount.

The following is the financial statement of the Honorary Treasurer for the year ending April 30th, 1917. The statement includes the Government Grant Account and the General Account and it has been audited by two members of the Society:—Dr. Adam Shortt and Dr. J. C. Glashan—who were appointed for that purpose:

STATEMENT OF RECEIPTS AND EXPENDITURE OF THE ROYAL SOCIETY OF CANADA FOR THE YEAR ENDING 30th APRIL, 1917

GOVERNMENT GRANT ACCOUNT.

Receipts.

By	Balance in Bank of Montreal, 30th April, 1916	$ 2,509.53
„	Grant from Dominion Government	8,000.00
„	Bank Interest on Account	209.70
		$10,719.23

Expenditure.

To	Printing and Publication of Society's *Transactions* (Parts vols. IX and X) and notices	$ 5,362.41
„	Maintenance of Society's library: Librarian and General expenses	716.66
„	Clerical Assistance	365.00
„	Engraving, Printing and Preparation of Diplomas	194.00
„	Foreign postage on *Transactions*	79.00
„	Storage and insurance of Society's books	44.00
„	Expenses of Annual Meeting, 1916	38.40
„	Incidental expenditures	30.14
„	Balance in Bank of Montreal, 30th April, 1917	3,874.62
„	Cheque outstanding from 1915–16	15.00
		$10,719.23

GENERAL ACCOUNT

Receipts

By	Balance in Merchants Bank of Canada, May 1st, 1916	$1,795.77
„	Annual subscriptions	650.20
„	Sale of *Transactions*	15.60
„	Interest on Investments: Standard Trusts Co.	249.59
	Lampman mortgage	136.50
„	Bank Interest on Account	33.41
		$ 2,881.07

Expenditures

To	Railway fares of Members attending Annual and Council meetings	$ 497.05
„	Expenses of Popular Lecture and Annual Meeting	167.35
„	Purchase of additional mortgage on Lampman Estate	400.00
„	Contribution towards publication of Annual Tables of Chemical and Physical Constants	50.00
„	Incidental Expenditure	10.00
„	Balance in Merchants Bank of Canada, April 30th, 1917	1,764.47
		$ 2,888.87
	Less outstanding cheque	7.80
		$ 2,881.07

Audited and found correct.
ADAM SHORTT, } *Auditors.*
J. C. GLASHAN, }

Ottawa, May 9th, 1917.

C. GORDON HEWITT,
Honorary Treasurer.